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(54) Title: METHOD AND DEVICE FOR COOKING AND VACUUM PACKING OF MUSSELS WITH MICROWAVES

(57) Abstract

The invention relates to a method and a device for cooking and vacuum packing mussels with their shells and other foodstuffs by microwave heating so that they can be stored as chilled or frozen goods for an extended period. When mussels are vacuum packed, many of the shells often break, and moreover the subsequent cooking in water is too slow for the mussel meat to coagulate satisfactorily. The invention solves this problem by packing the product to be preserved, in the first place mussels, in a somewhat flexible plastic container which is sealed. On the top side of the container there is a venting hole which permits the escape of steam during boiling but which is sealed immediately as microwave heating ceases, whereupon a vacuum arises inside the container as the steam condenses. A vacuum packed and pasteurised product is thus obtained in one and the same operation.

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Method and device for cooking and vacuum packing of mussels with
5 microwaves

The invention relates to a method and device for the cooking and vacuum packing of mussels by the use of microwaves, such that said mussels can be stored as chilled or frozen goods.

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A dish of mussels attains its best quality when prepared from fresh, live mussels. Such mussels still retain seawater within their shells, which yields an delicious liquor when cooked. After being out of the water for a time, mussels tend to open and the trapped water escapes, whereupon the mussels dry out and eventually die.

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The smaller-sized young mussels die more rapidly in this way than large, old mussels, which remain closed for a longer time when kept out of the water.

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Because of their short survival time out of water, these young mussels are never seen on sale; the fresh mussel market has to make do with older, large and often tough mussels. If it were possible, the consumer would prefer smaller, young mussels with tenderer meat and a larger proportion of meat.

Mussels, like other shellfish, cannot be frozen fresh and live without first undergoing heat treatment, because when frozen fresh the meat does not coagulate satisfactorily during cooking and on final preparation the result is meat that sticks to the shell and is of poor consistency. For satisfactory coagulation of the mussel meat during cooking, the heating phase must be rapid and the mussel should be cooked through within three minutes. To achieve such rapid heating, mussels are 25 cooked industrially in an autoclave by means of steam which is fed rapidly at approximately 125 degrees Celsius. Equally rapid coagulation can be achieved by

microwave heating, but when cooked in this way the mussels "explode", whereupon the juice escapes and the mussel meat dries out.

- In order to avoid oxidation (rancidity) of the fat that they contain, it is usual to
5 vacuum pack shellfish with an inert gas, e.g. carbon dioxide. Mussels can be
vacuum packed if they have strong shells, i.e. older mussels whose shells have
thickened. Young mussels have thin shells which break very easily when the bag
is evacuated, and these mussels are therefore very difficult to pack in vacuum
bags without excessive shell breakage.
- 10 If a vacuum-packed bag of mussels is heated in a microwave oven, the bag
expands and bursts as the water contained in the mussels is vaporised. For this
reason such bags are generally heated in water, in which case heating does not
take place as quickly as is desirable in order for the mussel meat to coagulate in a
satisfactory manner (see above). To achieve sufficiently rapid cooking of vacuum
15 packed mussels a retort cooker with overpressure facility is used (Patent No. EP
0 721 743 A1 Turner Nelson NZ). The entire process including come-up time and
cooling in the cooker takes approximately 30 minutes and the cooking process
cannot be made continuous. Compare with the present method, wherein
evacuation and cooling take place in the same operation in less than five minutes
20 in a process which can be made continuous in a microwave tunnel.

There exist special packages and containers for heating by microwave energy: US
Patent No. 85 306 262.8 relates to a gas-tight plastic can having a valve which is
opened once to release overpressure as the can is heated. This patent relates to the
25 sealing of the vent opening, which is designed to open spontaneously during
microwave heating. US Patent No. 5 750 967 relates to a plastic container for the
storage and microwave heating of foodstuffs, which container can be reused. A
valve is provided on the upper side of the pack to release overpressure arising
during cooking and to admit air during cooling, so that the pack does not deform.
30 Furthermore, Unilever Patent No. 1,550,000 relates to a packaging which is

vented in a special way during heating and cooling so that vacuum does not arise inside the packaging.

- One method of producing frozen mussels in their shells is to pack said mussels prior to cooking into a large (approx. 40 kg) container which is then submerged in hot water (EP 0 094 362 A1 Lars Göran Carlsson). After heating, the container is frozen with the mussels inside. When the mussels are frozen, the container is opened and the mussels are removed and shaken apart in their frozen state so that they are single. This process too requires mussels with thick shells so that they do not break during handling. The final product is single cooked mussels with shells. In this patented process, once again, the cooking is too slow (see above), the final product is not pasteurised, and the process requires mussels with thick shells, i.e. old, large mussels.
- The purpose of the invention is to make possible the use of young, thin-shelled mussels which according to most connoisseurs have the best consistency, size and taste, for a pasteurised or frozen product which can be stored for a considerable time prior to its final use. The same invention is also suitable for the packaging of other liquid or solid foodstuffs industrially or for home use in order to obtain a pasteurised or frozen product.

Description of method and device

The container is made of a plastics material capable of withstanding microwave cooking and freezing without bursting. The shape and size of the container is determined by the requirement that the temperature at every point inside the container be raised to boiling point by means of microwaves together with thermal conduction within approximately four minutes. At an input of 1 kilowatt of microwave energy the maximum quantity of mussels permitting sufficiently rapid coagulation throughout the whole container is approximately 400 grams.

On the upper side of the container there is an opening (diameter approx. 5 mm) which permits the escape of air and steam when the product inside the container is brought to the boil. When the input of microwave energy has ceased the opening is sealed and the steam begins to condense inside the container. During
5 condensation a vacuum arises and the container must be flexible enough to mould itself to its contents to some degree.

When mussels have been processed, a round can of diameter 110 mm and height 80 mm with an airtight lid was used. An opening is provided in the lid. The can is
10 completely filled with mussels, sealed, and brought to boiling point in a microwave oven. During boiling, each mussel is able to release the overpressure arising inside its shell without exploding, as there is room for the shell to open slightly. The overpressure inside the container is released through the opening. When boiling ceases, the opening is immediately closed with self-adhesive tape
15 and the can contracts somewhat, while the mussel shells inside the can close up completely. The fact that the mussels inside the container are closed also helps to prevent the drying out of the mussel meat during extended frozen storage of the package.

Claims

1. A method for the cooking and vacuum packing of mussels or other foods, wherein said cooking and vacuum packing take place in the same operation in the container wherein the food remains during subsequent storage. Heating takes place by means of microwave energy and vacuum packing is effected by closing, as soon as the input of microwave energy ceases, a venting opening used for the release of overpressure during boiling. When the container begins to cool, the steam therein condenses whereupon a vacuum arises inside the container.
- 10 2. A method according to claim 1, wherein a flexible container is used which moulds itself to its contents as vacuum arises inside the container.
- 15 3. A method according to claims 1 and 2, wherin all the ingredients necessary for a ready-to-eat meal are packed in with the mussels or other foods before the container is cooked.
- 20 4. A device for cooking and vacuum packing mussels and other foods, consisting of a container such as a plastic can, plastic bag or plastic tray, made of material which can withstand microwave heating and frozen storage and is tough enough to be suitable for vacuum packing; wherein a venting opening is provided on the top side of the container through which air and steam can escape during boiling, and which is sealed manually or automatically as soon as boiling ceases.
- 25 5. A device according to claim 4, wherein the container is flexible so that the mussels can open slightly permitting overpressure inside the mussel shells to escape, and which, when vacuum arises in the container as the steam condenses, has the capacity to mould itself to its contents so that the mussel shells are closed up and the space for spillage inside the container is minimised.

6. A device according to claim 4 or 5, wherein the vent opening is sealed manually or automatically by means of self-adhesive tape.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00974

A. CLASSIFICATION OF SUBJECT MATTER**IPC6: A23B 4/01, B65D 81/34**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A23B, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0174188 A2 (MINNESOTA MINING AND MANUFACTURING COMPANY), 12 March 1986 (12.03.86), figures 2,4, abstract --	1-6
A	US 5750967 A (SPRAUER, JR.), 12 May 1998 (12.05.98), abstract --	1-6
A	EP 0242183 A1 (CLONCORRY LIMITED), 21 October 1987 (21.10.87), claims 1-3 --	1-6
A	GB 1550000 A (UNILEVER LIMITED), 8 August 1979 (08.08.79), page 1, line 21 - line 33 --	1-6

 Further documents are listed in the continuation of Box C. See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0721743 A1 (TURNER, JOHN CHARLES ET AL), 17 July 1996 (17.07.96) --	1-6
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Information on patent family members

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30/08/99

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